years ago it occupied a very conspicuous position, and Auwers's work on the German share in the complete investigation exhibits at least all that could be derived from the process. Of still earlier date, and of unquestioned excellence and success, were his discussions of the variable proper motion of Sirius and Procyon. How brilliantly his location of the position of the unsuspected satellites was justified, is well known.

It would be impossible to do justice in a short notice to talents so varied and to an industry so active as Auwers exhibited throughout a long career, but it may be permitted to say that, notwithstanding the bitter estrangement that separates us from German thought and German ambitions, every English astronomer would be willing to lay a tribute of respect on the grave of Arthur Auwers. W. E. P.

NOTES.

SIR ANTHONY A. BOWLBY has been chosen Bradshaw lecturer of the Royal College of Surgeons of England for the ensuing year.

IT is announced in *Science* that Prof. R. H. Richards, professor emeritus in the Massachusetts Institute of Technology, has been awarded the gold medal of the Mining and Metallurgical Society of America in recognition of his services in the advancement of the art of ore dressing.

AT the meeting of the Royal Geographical Society on Monday, February 22, Dr. Page, the American Ambassador, presented to Dr. Scott Keltie, secretary of the Royal Geographical Society, the Cullum gold medal for long and eminent service to geography, awarded by the American Geographical Society.

THE gold medal of the Institution of Mining and Metallurgy—the "blue ribbon" of the profession—has been awarded to a distinguished Canadian, Dr. Willet G. Miller, provincial geologist of Ontario, in recognition of the eminent services rendered to mining by his admirable work as an economic geologist.

THE officers of the Royal Astronomical Society elected at the annual meeting on February 12 were as follows:—*President,* Prof. R. A. Sampson; *Vice-Presidents,* Dr. J. W. L. Glaisher, Major E. H. Hills, Dr. W. H. Maw, and Prof. H. H. Turner; *Treasurer,* Mr. E. B. Knobel; *Secretaries,* Prof. A. S. Eddington and Prof. A. Fowler; *Foreign Secretary,* Prof. Arthur Schuster.

PRINCE B. GALITZIN has been elected an honorary fellow of the Physical Society. The following is the list of officers of the society elected for the ensuing year:—*President,* Sir J. J. Thomson. *Secretaries,* Dr. S. W. J. Smith (Royal College of Science, S.W.), and Dr. W. Eccles (University College, Gower Street, W.C.). *Foreign Secretary,* Dr. R. T. Glazebrook. *Treasurer,* W. Duddell. *Librarian,* Dr. S. W. J. Smith.

AT the annual general meeting of the Geological Society, held on February 19, the following officers were elected:—*President,* Dr. A. Smith Woodward; *Vice-Presidents,* Dr. H H. Bemrose, Mr. Clement Reid, Dr. A. Strahan, and the Rev. H. H. Winwood; *Secretaries,* Dr. H. H. Thomas and Dr. H. Lapworth; *Foreign Secretary,* Sir Archibald Geikie, O.M., K.C.B.; *Treasurer,* Mr. B. McNeill. The president's address delivered at the meeting dealt with the evolution of the fishes in geological time.

THE virtual German monopoly in the manufacture of dye-wares is a matter of national concern in other countries as well as in Britain. It is announced that arrangements have been made by the Benzol Products Company of Philadelphia to commence dye manufacturing on a large scale in about six months' time. A new company, styled the "Russian Society of Chemical Industry," has also been formed in Moscow to manufacture dyes for the sixty large consumers in that district.

ON Tuesday next, March 2, Prof. W. J. Pope will begin a course of two lectures at the Royal Institution on colour photography (scientific applications): (1) "Photographic Appreciation of Colour in Monochrome"; (2) "Photography in Natural Colours"; and on Thursday, March 4, Sir Herbert Warren will begin a course of two lectures on poetry and war. The Friday evening discourse on March 5 will be delivered by Prof. E. B. Poulton on mimicry and butterflies, and on March 12 by Sir Rickman J. Godlee on back to Lister.

NEWS has been received of the arrival at Khartum of Dr. C. Christy, who has been engaged during the past three years on a zoological mission in the Belgian Congo undertaken officially on behalf of the museum at Tervueren. We hear that he has made very large collections of the animals of the Ituri forest and other regions of the Congo traversed by him, though it is difficult to say what is to become of the specimens under the conditions existing in Brussels. Dr. Christy was fortunate in shooting two okapi, thus joining the very small band (not more than three or four) of white men who have shot an okapi. Nearly all the specimens now in Europe were killed by natives. Dr. Christy's bag also included several specimens of Meinertzhagen's great black forest pig and many of the dwarf Ituri buffalo.

Science announces the following deaths of men known in the scientific world:—Dr. Anthony Woodward, at one time assistant in the department of geology and for thirty-seven years librarian of the American Museum of Natural History, New York City; M. Alfred Tournier, formerly professor of viticulture at the University of California and later connected with the U.S. Department of Agriculture, who was killed on December 12 in the war; Dr. C. F. Brackett, professor emeritus of physics in Princeton University, in his eighty-second year; Dr. B. Sharp, formerly corresponding secretary of the Philadelphia Academy of Natural Sciences and professor of invertebrate zoology there and in the University of Pennsylvania, aged fifty-six years.

WE regret to announce that among the victims of the war must be numbered M. Joseph Déchelette, the eminent French archæologist, who was killed in action on the Aisne on October 4 last, at the age of fifty-three. His most important work was the "Manuel d'archéologie préhistorique celtique et gallo-romaine," which, unhappily, after the issue of two volumes, remains unfinished. He also, in collaboration with M. E. Brassart, published "Les peintures murales du Moyen âge et de la Renaissance en Forez." He was also the author of works on "L'oppidum de Bibracte," "Les fouilles du mont Beuvray," and "Vases céramiques ornés de la Gaule Romaine," for which he was awarded the medal of the Académie des Inscriptions et Belles-Lettres, and was appointed Chevalier of the Legion d'honneur. The death of this indefatigable archæologist, who was Conservateur of the Musée de Roanne, is a serious loss to French archæology.

ALTHOUGH much of the activity of research laboratories has been curtailed by the war owing to the patriotic action of the younger workers joining one of the Services, there remain a number of men and women carrying on research. In the subject of chemistry special difficulties have arisen because practically all very pure chemicals have hitherto been made in Germany. No very large stock of chemicals of this description is held by dealers, but researches either completed or abandoned have left a considerable amount in public and private laboratories in this country. In an attempt to render these stocks available to workers, the chemical department of the Imperial College, South Kensington, has started a bureau of exchange. Circulars have been sent to most of the university and college laboratories in the kingdom asking for lists of chemicals which are not in immediate use. Many lists have already been sent, and workers who are in urgent need of fine chemicals have been put into communication with those who have some to dispose of. It is hoped that any chemist who has not received the circular will communicate with the bureau giving a list of the materials he has available and also his requirements. As a rule, chemicals have been sold at cost price, but the financial arrangements are left entirely to the buyer and seller.

THE Medical Committee of the British Science Guild has done a good work by its resolution condemning a notorious anti-vivisection advertisement. The object of the advertisement was to prevent our soldiers from being protected against typhoid fever. If it be asked why any one of the many anti-vivisection societies should behave in this way, we can only say with Dr. Watts that "Satan finds some mischief still for idle hands to do." Anti-vivisection since August has been more or less short of work. Few of us are wanting to hear Pasteur called a charlatan; few of us are wanting anti-vivisection lectures and shops. Everybody is sure, who is capable of clear thinking, that our men of science are neither cruel nor stupid. But anti-vivisection cannot rest. It must find something to attack, something to abuse. Happily, by mere vulgar abuse, it does itself more harm than good; and we may well believe that quiet, level-headed, charitable folk are mostly by this time sick of the very name of anti-vivisection. We hope that it will be many years before anti-vivisection emerges out of the public disgrace which it has brought upon itself. The resolution of the British Science Guild is fairly outspoken, though it might justly have used stronger language. We hope that it will be very widely circulated; half a million copies, distributed through the country, would be none too many

THE second Indian Science Congress was held, under the auspices of the Asiatic Society of Bengal, in Madras, from January 14 to 18 last. There was a large and representative attendance of delegates from all parts of India, and the Hon. Surg.-Gen. Bannerman, I.M.S., who is president, delivered an address. According to the *Pioneer Mail,* the president insisted on the importance of a knowledge of biology to medical, sanitary, and scientific men working in the tropics. In the course of an appeal to wealthy Indians to endow medical research so that their poor but capable fellow-countrymen might have something to look forward to as a reward for scientific toil, Surgeon-General Bannerman said:—"There are plenty of subjects for research which ought to be endowed, chairs in our medical schools and universities that ought to be established all over India. Indian universities are at present mere skeletons. Will no one here take up the rôle of beggar and try to extract a few lakhs of rupees from the hoards of his wealthy and aristocratic friends?" Continuing, he said India wants to have, not only more chairs and lectureships, but also research scholarships or fellowships, established fellowships, available for a student and research worker, so that he may live in reasonable comfort and be able to devote his whole energy to work, without anxiety for those depending on him. In Madras a beginning has been made in this direction, owing to the enlightened liberality of the Raja of Pithapuram, who has presented 50,000 rupees for the expenses of an inquiry into diabetes, the fell disease which has carried off so many of the best brain workers in this part of India.

THE authorities of the Sheffield Public Museums are to be congratulated on the attention they are devoting to the collection and classification of documents and other records relating to local history. The systematic collecting of such records, as we learn from the report for the period from March, 1912, to March, 1914, was commenced at the High Hazels Museum in 1901, and afterwards extended to the establishment in Weston Park. The gift to the Public Library of the "Jackson Collection," rich in documents relating to Sheffield, has largely added to the value and interest of the series, which is now very extensive.

"PIGMY" stone implements form the subject of an article, with two plates, by Mr. C. Hartley in *Spolia Zeylanica* for December last (vol. x., pt. 36). Such implements occur locally in many parts of the world, including the British Islands, but they are nowhere more common than in Ceylon, where they occur in great profusion at Bandarawela. At least ten distinct types of these implements are recognised by the author, but axe-heads, together with saws, spearheads, and punches, are totally wanting. The question whether the pigmy and the ordinary Neolithic types of implements were manufactured and used simultaneously by a single race is, for the present, left without a definite answer.

IN *Man* for January Mr. Edge Partington supplies a graceful obituary notice of Mr. Norman Hardy, one of the best of our anthropological artists, who died about a year ago. His work began with illustrations for Dr. Beddoes's "Races of Mankind." He travelled widely in Australia and the Pacific, and some of his best drawings appeared in "The Savage South Seas" and "Women of all Nations." In 1907 he went to the Kasai with the expedition led by Mr. E. Torday, and his last work was the tracing of the wall paintings in the tombs of the Kings at Thebes. He was for many years an active member of the Royal Anthropological Institute, where the simplicity and kindliness of his nature, as well as his skill as an artist, won him the regard of many friends.

IN the proventriculus of the flea there is a valvular arrangement of chitinised spine-like epithelial cells which normally prevents the regurgitation of blood from the stomach during the act of sucking. A. W. Bacot and C. J. Martin have shown that in the plague-infected flea this mechanism is upset by a copious growth of plague bacilli which gets entangled among the spines, thus allowing the regurgitation of infected blood and the infection of a new host. In the fourth Plague Supplement of the *Journal of Hygiene* (January), this mode of transmission of plague by the flea is further elucidated by Bacot as the result of a study of serial longitudinal sections of infected fleas. Bacot also shows that in cool weather fleas are able to survive and to carry *B. pestis* for periods up to forty-seven days in the absence of any host, and afterwards to infect mice. He also shows that under experimental conditions bugs can transmit plague from mouse to mouse. Active healthy mice however, eat the bugs, and an ingenious arrangement is described whereby the bugs are given shelter in saw cuts in the walls of wooden tubes in which the mice reside. Blood in the bug's stomach does not form so favourable a medium for the growth of the plague bacillus as in that of the flea, and it would therefore appear that the bug is not likely to be an active carrier of the infection under natural conditions.

THE June number of *Peru To-day* contains an article entitled "The Conquest of Verruga," by Mr. C. H. T. Townsend, entomologist to the Peruvian Government. The author gives a brief summary of the results of his investigations upon Verruga Peruana, a disease which causes great ravages and much mortality in the Andes, and he claims to have solved the problem of the etiology of the disease and to have proved conclusively that it is transmitted by a tiny fly, a species of Phlebotomus, to which he has given the name *P. verrucarum.* The fly is crepuscular and nocturnal in its habits, remaining hidden by day in caves or in crevices in rocks and in the walls of human habitations. Protection against the fly, and consequently against the disease, can be obtained by sleeping under muslin-nets, by applying ointments to the exposed parts of the body just before dark, and by the use in bedrooms of electric fans arranged in such a way as to direct strong currents of air towards the open windows through which the flies come in. The flies appear to breed in the canyons in which there is sufficient moisture to support a luxurious vegetation, but not in the dry canyons without vegetation; the life-history of the fly has not yet, however, been observed. The author believes that small rock-lizards constitute a reservoir for the disease, and that the flies, which feed naturally on the blood of these reptiles, transmit the virus from them to human beings.

ONE of the most difficult problems with which the museum curator has to deal is to find a satisfactory method of presenting fishes for public exhibition. Stuffed specimens are an abomination; spirit specimens, however cunningly painted, are worse; and the ordinary type of cast is altogether wanting in sharpness and definition, owing to the external layer of plaster being disintegrated by the mucus from the skin during the process of setting. For the latter defect Messrs. Gill and Fletcher, of the Hancock Museum, Newcastle-on-Tyne, claim, in the February number of the *Museums Journal*, to have found an effectual remedy, and, judging from the figure of one ready for painting, their casts certainly seem to be a great improvement on the old-fashioned type. A continuation of the article is to follow.

"AN Appreciation of Theodore Nicholas Gill," illustrated by a portrait in academical robes, is the title of an article communicated by Prof. A. Lucas to the January number of the *American Museum Journal.* Dr. Gill, who died in September last, is regarded by the author as having possessed an extraordinary grasp of various branches of zoology, and this despite a natural indolence, which led him to forgo personal investigation, and to rely largely on the work of others as a basis for his own generalisations. Among the latter "were the recognition of the claim of the elasmobranchs to a position of the 'highest' rank, and of the purely artificial nature of the groups Carinatæ and Ratitæ among birds." As regards the latter item, his views, which are undoubtedly correct, were diametrically opposite to those of the late Prof. Alfred Newton.

MR. S. TABER discusses the earthquakes of the Charleston district in the Bulletin of the American Seismological Society of America (vol. iv., 1914, pp. 108–60). The earthquake-series of 1886 was preceded by a prolonged interval of repose, only eight shocks being recorded during the previous two centuries. Since August, 1886, the decline of the after-shocks in frequency has been gradual though fluctuating, 318 being reported from 1886 to 1897, and 77 from 1898 to 1913. The shocks are most frequent in September and rarest in April. Mr. Taber considers the relations between earthquake-frequency and various meteorological and astronomical factors. He finds that shocks are most frequent after long-continued periods of local rainfall, when the pressure of the underground water is relatively greatest on the northwest side of the originating fault, and when the barometric gradient is directed to the south-east. On the other hand, he can discern no relations between earthquake-frequency and changes in barometric pressure or the tides of the neighbouring coast or sun-spot maxima or lunar periodicities.

Dr. E. Warren gives, in the Annals of the Natal Museum for September, 1914 (vol. iii., pt. 1), a full and well-illustrated description of a remarkable plumularian hydroid zoophyte discovered on living oysters in 1911 on the coast of Pondoland, of which a preliminary notice has already appeared. Although nearly allied to those species of Plumularia with hydrothecæ arising from the main stem, it differs by the presence of pinnules on some of the pinnæ, thereby approaching Schizotricha, in which nearly all the pinnæ are thus furnished. It is therefore provisionally included in that genus, as *S. simplex*. Its main claim to interest is, however, connected with its reproduction, which is of a unique type. Instead of the egg being furnished with a yolk-supply sufficient to maintain the young until capable of foraging for itself, as in the great majority of invertebrates, "the egg remains quite small and is never provided with a perceptible quantity of yolk, but segments, and development takes place, in a kind of maternal placental tissue which supplies the embryo with food during the whole development." In another article in the same issue Mr. H. C. Burnup reviews the minute pyramidal striated S. African land-snails of the genus Ennea, with descriptions of new species and races.

The recently received number of the *Philippine Journal of Science* (vol. ix., sec. c., No. 4, August, 1914) contains two papers by Mr. E. D. Merrill, in which no fewer than ninety-three new species of Philippine plants are described. Forty-three were collected by Wenzel in the island of Leyte, whose collections have already added very largely to a more complete knowledge of the rich flora of the archipelago. The other new species come from various islands, and are included in Mr. Merrill's tenth and concluding instalment of new or noteworthy Philippine plants.

Steps are being taken to secure the trade in senna in British hands. The plant from which the finest quality of senna is obtained grows in the Sudan, where the leaves and pods are collected and dried by natives, and sold to collecting agents for export. At one time this trade was entirely British, and the produce was sold through London, but afterwards it passed into German hands. The Imperial Institute has been in communication with the chief British importers and with the Egyptian Government, and the export of senna from Egypt has now been prohibited except to the United Kingdom and France. British firms are making arrangements direct with the native growers, which should not only restore the trade to this country, but lower the price and secure the purity of the supply.

Mr. W. G. Reed, of the Department of Geography of the University of California, presented a paper, "Climatic Provinces of the Western United States," to the Cordilleran Section of the Geological Society of America, and this paper has been printed in the Bulletin of the American Geographical Society (vol. xlvii., No. 1). After discussing various classifications, such as those of Supan and Herbertson, Mr. Reed advances a new classification based upon considerations of rainfall, temperature, and relief. The area from the coast to the Rockies is divided into four main regions, a northern and southern coast strip divided at 40° N., and a northern and southern "rain-shadow" strip divided about 43° N. The coast strips are subdivided mainly for topographical reasons into smaller divisions. The main divisions are, on the whole, just, since the whole rain-shadow area is characterised by a relative raininess in the month of May, which is lacking along the coast strip, but it seems probable that Mr. Reed has not made sufficient allowance for two facts regarding the coast strip. In Washington the month of maximum raininess is November, and the further south one goes the later in the season does this maximum occur, and at the same time the relative raininess shows considerable increase. Probably these facts would have commanded attention had Mr. Reed made rainfall graphs in a generalised form for his subdivisions instead of taking single places as types.

In the *Philosophical Magazine* for January Mr. A. E. Young obtains formulæ for the effect of stiffness and stretching on the form of a suspended wire or tape. The importance of these investigations largely depends on their application to the steel tapes and other substitutes for the old chain in modern surveying.

In a paper communicated to the Proceedings of the Cambridge Philosophical Society (xviii., 2), Dr. Norbert Wiener proves in a short note that the shortest curve dividing a given area in a given ratio consists of a circular arc or a number of such arcs, each terminated on the boundary of the area. The paper was originally intended to be a joint article by the author and Dr. Szász, and to contain a proof that the shortest curve dividing any scalene triangle in a given ratio is a circular arc with the most acute apex as centre. Owing to the war this has not been possible, but the results are so self-evident to an average English mathematician that no advantage would have been gained by a further discussion in print. The simplest plan is to replace the author's words, "dividing an area in a given ratio" by "cutting off a segment of given area from a given closed figure." The proof that the portion of the curve joining any two points on it is an arc of a circle is found in most text-books, and the reader should have no difficulty now in seeing, further, that the arc in question must meet the boundary at right angles (unless it passes through a re-entrant angle), whence the property which Dr. Szász intended to prove follows immediately.

The December number of *Terrestrial Magnetism and Atmospheric Electricity* contains the results of the determinations of the deviation of the compass made on the magnetic survey ship *Carnegie* during her voyages from Brazil to St. Helena in 1913, and from

Norway to Iceland and thence to New York in 1914. The published charts of the South Atlantic all show the westerly deviation too small by a degree, or in one or two cases nearly two degrees, in the region 30° S., 24° W. Between Norway and Iceland the charts show deviations to the west 2° or 3° too small, between Greenland and Labrador they are 1·5° to 2° too high, and the British chart is nearly 3° too low at 55° N., 52° W. Along the east coast of America there are no serious errors in the charts as at present issued, although the U.S. chart is the least accurate of the three available.

SCIENTIFIC PAPER No. 231, issued by the Bureau of Standards, is devoted to a determination of the specific heat of copper over the temperature range 10° to 50° C., by Mr. D. R. Harper, of the bureau. The specimen of copper consisted of 50 metres of very pure annealed wire of 2·5 millimetres diameter wound into a compact coil 10 cm. diameter and 10 cm. long, with thin sheets of mica to maintain the insulation. The coil was suspended by silk threads in a vacuum vessel, and heated by an electric current sent through it. The current and potential difference at two points near the ends of the wire were determined by a potentiometer method. The standardisation of the wire as a resistance thermometer was carried out by the bridge method with the help of two standard platinum resistance thermometers. During the determination of specific heat the copper wire served as test specimen, as calorimeter, and as thermometer. The final result for the specific heat is $0{\cdot}0917+0{\cdot}000048(t-25)$ calories per gram degree.

A COPY of a "Biographical Sketch of James Smithson" has been received from the Smithsonian Institution at Washington. It is an abridgment of a chapter on James Smithson by the late Dr. S. P. Langley in "The Smithsonian Institution, 1846–1896: the History of its first Half Century." The founder of the institution was born in 1765. He graduated at Pembroke College, Oxford, in 1786. At a time when the study of physical science was almost unknown in the University, he appears to have conceived already that devotion to scientific research which characterised all his future life. He was admitted as a fellow of the Royal Society in 1787, his recommendation being signed, among other men of science, by Cavendish, who became an intimate friend. Arago, too, was added to his friends later, and he was a correspondent of Black, Banks, and Thomson. Smithson died at Genoa in 1829. His will provided that in the event of the death of his beneficiaries, his property should pass to the United States of America "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." Thus his dearest wish that "my name shall live in the memory of man when the titles of the Northumberlands and the Percys are extinct and forgotten" seems likely to be accomplished.

AN electric tramway—described in *Engineering* for February 19—has been constructed recently to connect Osaka, which is the foremost industrial and commercial centre of Japan, with the town of Nara. The line is 19 miles long, and the steepest gradient is 1 in 30. The cars, which accommodate 100 passengers, and weigh 32 tons when fully loaded, are mounted on two trucks equipped with 160 horse-power motors. It was desired to keep the line as straight as possible, and the route selected for this reason involved the construction of four tunnels, the most important of which is the Ikoma tunnel. In cross-sectional area, this tunnel is the largest in Japan, and its length, which is 11,088 ft., is only exceeded by that of the Sasago tunnel on the Imperial Japanese Government Railways. The tunnel penetrates the Ikomayama Mountains, which rise to a height of 1500 ft. above sea-level. No shafts were used in the construction; work was commenced from both ends simultaneously in July, 1911, and the tunnel was completely finished in April last.

THE publishers of the *Revue générale des Sciences pures et appliquées* (Librairie Armand Colin, 103 Boulevard Saint-Michel, Paris, 5e), have issued general indexes of the contents of the first twenty-five volumes (1890–1914) of our contemporary. There are two indexes; one is a subject index arranged under twenty headings according to the branch of science with which the articles are concerned, the other is an index arranged under authors' names. These excellent indexes will save readers much time and trouble when anxious to trace an article published several years ago. The price of the publication is 3.50 francs.

MESSRS. G. BELL AND SONS, LTD., announce the publication at monthly intervals of sets of "Test Papers in Mathematics" for use in secondary schools. The series will be begun in May, and the first three sets to be issued will be compiled respectively by Mr. G. W. Palmer, Prof. T. P. Nunn, and Mr. H. C. Beaven.

OUR ASTRONOMICAL COLUMN.

COMET NEWS.—A telegram from Prof. Strömgren, dated February 19, announces the discovery of an object by Miss Leavitt as Metcalf's periodical comet (1906 VI.). The discovery was made on February 9 at 12h. 33·7m. Harvard mean time, the position of the object being given as R.A. 8h. 30m. 37s., declination −1° 38′ 42″. No idea of the brightness of the comet is given, but as perihelion was passed last June the object may be considered very faint.

With regard to Mellish's comet, a further telegram gives details of an observation made at the Tashkent Observatory, Russia. On February 15, at 17h. 31·0m. Tashkent mean time, the comet's position was R.A. 17h. 9m. 11s., declination +2° 47′ 43″.

A numerous and interesting series of observations of Delavan's comet (1913*f*) is contained in the latest issue (November) of *L'Astronomie*. M. Quénisset contributes several photographs taken in August and September last illustrating the development of the tail. Of special interest perhaps are the observations of M. H. Law, of Hörsholm, Denmark. This observer made a number of estimations of the brightness of the comet, and found a distinct fluctuation in magnitude in a period of about three weeks. The magnitude of this change is illustrated in a table and